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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HIROSHI SUGITATSU, HIDETOSHI TANAKA,
TAKAO HARADO, ITSUO MIYAHARA, and
ISAO KOBAYASHI

Appeal 2009-003565
Application 10/541,457
Technology Center 1700

Decided:¹ June 17, 2009

Before CHUNG K. PAK, KAREN M. HASTINGS, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

HASTINGS, *Administrative Patent Judge*.

DECISION ON APPEAL

¹The two-month time period for filing an appeal or commencing a civil action, as recited in 37 CFR § 1.304, begins to run from the Decided Date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-8. An oral hearing was held on June 9, 2009. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

BACKGROUND

The invention relates to a method of reducing a chromium containing material (Spec. 5:3-11).

Claim 1 is illustrative (paragraphing added):²

1. A method for reducing a chromium-containing material, comprising
a mixing step of mixing a chromium-containing material
comprising chromium oxide and iron oxide and a carbonaceous reluctant to
provide a mixture;

and a reducing step of heating, and reducing the mixture with a
rapid temperature rise by radiation heating in a moving hearth furnace to
provide a reduced mixture,

wherein the average rate of raising the temperature of the
mixture in the reducing step is 13.96°C/s or higher in the period from the
initiation of the radiation heating of the mixture until the mixture reaches
1,114°C.

The Examiner relies upon the following prior art references in the rejection of the appealed claims:

Kundrat	5,567,224	Oct. 22, 1996
Meissner	5,730,775	Mar. 24, 1998
Takeda	6,270,552 B2	Aug. 7, 2001
Kikuchi	6,592,649 B2	Jul. 15, 2003
Ibaraki	6,755,888 B2	Jun. 29, 2004

Perry's Chemical Engineer's Handbook 5-23, (Univ. of Kansas et al. eds., 7th ed. 1997) (hereinafter, *Perry's*)

² To the extent that Appellant has presented substantive arguments for separate patentability of any individual claims on appeal, we will address them separately consistent with 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner has rejected the claims under 35 U.S.C. § 103(a) as follows:

claims 1 and 7 as unpatentable over Kundrat, or Kikuchi, or Ibaraki (alone or in view of Takeda), in view of Meissner and *Perry*'s;

claims 3, 4 and 8 as unpatentable over Kundrat or Kikuchi, in view of Meissner and *Perry*'s; and

claims 5 and 6 as unpatentable over Kikuchi in view of Meissner and *Perry*'s.

The Examiner finds that each primary reference describes a method for reducing chromium oxide containing material wherein the initial charge of material is quickly heated in a rotary hearth furnace by radiation heating to a temperature of 1000°C or more, but acknowledges that none of the references explicitly describes that the “average rate of raising the temperature . . . is 13.96°C/s or higher” as claimed. Nonetheless, the Examiner finds that the teachings of each of Kundrat, or Kikuchi, or Ibaraki (alone or in view of Takeda), when viewed with Meissner and *Perry*'s, would have rendered the claimed range of temperature elevation rate obvious, and accordingly concludes that:

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have adjusted the radiant heat source temperature as a result-effective variable in the process of Kundrat or Kikuchi et al or Ibaraki et al alone or in view of Takeda et al, therefore adjusting the rate of heating to affect the time required to achieve metallization goals and thereby increase productivity as taught by Meissner et al (see MPEP § 2144.05 II B).

(Ans. 6).

ISSUE

Have Appellants shown reversible error in the Examiner's conclusion that the "average rate of raising the temperature . . . [of] 13.96°C/s or higher" as recited in claim 1 would have been *prima facie* obvious over the applied prior art?

We answer this question in the negative.

FINDINGS OF FACT (FF)

Findings of fact throughout this opinion are supported by a preponderance of the evidence.

The Examiner correctly found that each of Kundrat, Kikuchi and Ibaraki³ describes a method of reducing chromium-containing material in a rotary hearth furnace using radiation heating as claimed, including rapidly raising the temperature to approximately the same temperature as recited in claim 1 or higher, except that each reference does not explicitly describe how rapidly the temperature is raised in the period of initiation of the radiation heating until the mixture reaches 1,114° C (Ans. 3-4).

Appellants' Specification states that after the furnace is charged and heated, the chromium material is reduced at a temperature is 1,250°C to 1,400°C and that the residence time "in the radiation heating region is preferably 5.3 to 42.7 minutes" (Spec., para. bridging pp. 20-21).

Kikuchi describes "rapidly raising" the temperature to 1100°C (col. 13, l. 42 to col. 14, l. 5) after charging the furnace, and that reduction takes place at 1200° to 1400°C (col. 7, ll. 38-53).

³ The Examiner applied Takeda only to illustrate that one of ordinary skill in the art would have expected that the heat transfer mechanism in Ibaraki is radiant heating (Ans. 4, 5), which Appellants do not dispute (*see generally*, App. Br; Reply Br.).

Ibaraki describes that the pellets are “quickly heated” to temperatures as high as 1100° to 1300°C, and have a residence time of 5 to 20 minutes for the reduction to take place (col. 2, ll. 1-5).

Kundrat describes radiant heating of a thin layer of material to be reduced to at least 1000°C, preferably 1200 °C (col. 4, ll. 19-40; col. 8, ll. 1-26); a thin layer (40 nm or less) of material is used in order to minimize the time required for heating the mixture (col. 8, ll. 38-65), which the Examiner contends will result in rapid heating (Ans. 3).

One of ordinary skill in the art would have appreciated from the above teachings that rapidly raising the temperature to at least 1000°C or higher under reducing conditions after the furnace was charged with a chromium-containing material was desirable.

Appellants admit that it was known in the prior art to reduce zinc oxide and iron oxide pellets by heating at a temperature elevation rate as high as 13°C/sec within a temperature range of 150° to 900°C (App. Br. Evidence App., Harada Declaration, para. 8).

The Examiner correctly finds that Meissner describes reducing iron oxide in a rotary hearth furnace with radiant heating and teaches the benefit of increasing the heating rate to more quickly reach metallization goals and thus improve productivity (col. 5, ll. 1-21; Ans. 5). Specifically, Meissner teaches that “rapid heating and high reduction temperature” (col. 4, ll. 64-65) can “increase hearth productivity by 30 to 100%” (col. 3, ll. 18-28). The Examiner also correctly relies upon *Perry*’s to exemplify that one of ordinary skill would have realized that the rate of radiant heat transfer in a furnace is strongly dependent upon temperature (Ans. 5, 6).

One of ordinary skill in the art would have appreciated from all of the above teachings that both the temperature and time (and, accordingly, the rate of temperature elevation) are known result-effective variables in a rotary hearth furnace with radiant heating.

PRINCIPLES OF LAW

The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. These cases have consistently held that the Appellants must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990). *See also In re Boesch*, 617 F.2d 272, 276 (CCPA 1980) (“[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.”); *see also In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (“where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”).

Moreover, as our reviewing court stated in *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (emphasis added):

In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a *prima facie* case of obviousness. . . . We have also held that a *prima facie* case of obviousness exists when the claimed range and the prior art range do not overlap but are *close enough* such that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985).

In re Peterson also instructs us that “[t]he normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to [optimize ranges].” 315 F.3d at 1330.

ANALYSIS

Appellants contend that the presently recited rapid temperature rise is “neither disclosed or suggested” by the prior art (App. Br. 4). Appellants further contend that Meissner has nothing to do with reduction of chromium-containing materials (App. Br. 5)⁴, that both Meissner and *Perry*’s are “essentially irrelevant”, and that the temperature elevation rate “was not a known result-effective variable” (App. Br. 7). Appellants filed on September 7, 2007 a Declaration under 37 CFR § 1.132 by co-inventor Takeo Harada (Harada Dec.) in support of these arguments. These contentions are not persuasive of reversible error for the following reasons.

Kundrat, Kikuchi and Ibaraki each teaches or suggests rapidly heating the initial charge of a chromium-containing material to be reduced in a rotary hearth furnace to the approximate temperature, or higher, as recited in claim 1 (*see*, FF). Appellants do not dispute that Meissner teaches the benefit of rapid heating and higher temperatures for reducing iron oxides in a rotary hearth furnace to improve productivity, and that *Perry*’s illustrates that a higher temperature in a radiant furnace results in a higher heating rate (*see*, FF; *generally*, App. Br.; Reply Br.). Appellants indeed admit that rates as high as 13°C/second have been used during temperature elevation before reducing zinc oxide and iron oxide pellets (*see*, FF).

⁴ However, Appellants do not contest the Examiner’s determination that Meissner is analogous art (*see*, App. Br. 8, Reply Br. 2).

It follows that with rapid heating, time and temperature are fundamental result-effective variables in a radiant furnace reduction. Thus, contrary to Appellants' contentions, we determine that one of ordinary skill in the art would have appreciated that optimizing the rate of rapid heating was within the level of ordinary skill in the art. One of ordinary skill in the art would have arrived at the optimum rapid heating rate specified in claim 1 through routine experimentation for the chromium oxide reduction process of Kundrat, Kikuchi, or Ibaraki. *In re Aller*, 220 F.2d at 456. *See also, e.g., KSR Int'l Co. V. Teleflex Inc.*, 550 U.S. 398, 420-421 (one of ordinary skill in the art is "also a person of ordinary creativity, not an automaton").

Based on the foregoing, it is reasonable to conclude that the use of the rapid heating rate of 13.96°C/s or higher as claimed would have been prima facie obvious from the teachings of the applied prior art, as the applied prior art provides a reasonable expectation of obtaining a successful chromium oxide reduction. The use of the claimed heating rate appears to be no more than optimization of known result-effective variables (time and temperature).

With our conclusion that the Examiner has provided a prima facie case of obviousness, Appellants can show secondary considerations such as unexpected results or criticality to overcome the prima facie case. *See In re Huang*, 100 F.3d 135, 139 (Fed. Cir. 1996) (if claimed ranges are within the capabilities of one of ordinary skill in the art, the ranges are not patentable "unless the claimed ranges 'produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art.'") (quoting *Aller*, 220 F.2d at 456 and citing *In re Woodruff*, 919 F.2d at 1578). Here, Appellants do not provide any showing of secondary considerations or

criticality; to the contrary, they state that no such demonstration is needed (Reply Br. 2).⁵

With respect to dependent claims 3 and 8, Appellants' remarks regarding the constant Fe metallization at higher temperatures (App. Br. 9) are not persuasive of error in the Examiner's rejection. Appellants do not dispute the Examiner's finding that each of Kundrat and Kikuchi teaches temperatures for the reduction of chromium-containing materials that are encompassed by the claimed ranges (Ans. 6, 7; *see generally*, App. Br.; Reply Br.). Accordingly, it would have been *prima facie* obvious to conduct the reducing step at temperatures within the ranges set out in dependent claims 3 and 8.

For the foregoing reasons and those stated in the Answer, we agree with the Examiner's findings in support of *prima facie* obviousness for the claims on appeal.

CONCLUSION

On balance, the evidence, including the prior art of record and the Appellants' Declaration, does not weigh in favor of a determination that the Examiner reversibly erred in rejecting the claims on appeal under §103.

Accordingly, we sustain all of the Examiner's § 103 rejections of claims 1-8.

ORDER

The Primary Examiner's decision is affirmed.

⁵ As Appellants admit, the purpose of the Harada Declaration was not to show criticality, but merely to support Appellants' arguments that *Perry* and *Meissner* are "irrelevant", and that the "temperature elevation rate is not a known result-effective variable" (App. Br. 7).

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No time period for taking any subsequent action in connection with this appeal maybe extended under 37 C.F.R. § 1.136(a).

AFFIRMED

tc

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